at the time of penetrating a stricture of the tube. Urbantschitsch reports cases of what he terms cortical epilepsy, but relief by single inflation marks the case as having been rather trivial, and Gradenigo well sums up in Schwartze's *Hand-book*, when he says: "The complication of ear disease in epilepsy must yet be often looked upon as accidental; the treatment of the one modifying in no way the disease process of the other."

REPORT OF TWO FATAL CASES OF BRAIN ABSCESS.[1]

By Edward Bradford Dench, M.D.,
of New York.

The following cases of brain abscess, although ending fatally, seem to me to be of sufficient interest to be reported in full:

I. G., aged fifty-two years, was admitted to the New York Eye and Ear Infirmary on February 6, 1905, with the following history: The patient had always been in good health; no specific history; used alcohol in moderation. A year ago he suffered from pain in the right ear, which disappeared in a few days. One month previous to the patient's admission to the hospital, he was taken with a severe earache. On the following day he consulted a physician, and was under treatment for two weeks, with some relief; there was a little discharge from the ear at this time. At the end of two weeks' time the pain in the ear had ceased, but the patient began to complain of pain in the right frontal region, over the right eye. The patient's family reported that for two weeks before his entering the hospital he had been decidedly worse, that he had alternate attacks of restlessness and drowsiness, but, as a rule, was able to sleep at night. He had only complained of pain in the right frontal region. Some staggering gait had been noticed during this period. The physician who treated him said that, with the inception of the earache, there was considerable swelling over the right mastoid process, and firm pressure in this region elicited pain. This tenderness and swelling had disappeared before the patient came under observation. On his admission to the hospital he seemed to be in much pain, was restless one minute and drowsy the next. The face had a marked septic appearance. The breath was foul and the tongue coated with a brownish coating. When left to himself, the patient seemed to drop off into sleep as though he were under the influence of some hypnotic, although the use of any hypnotic was denied. From this semiconscious condition the patient was easily aroused. On questioning him he said that he felt perfectly well, and he complained of absolutely no pain; there

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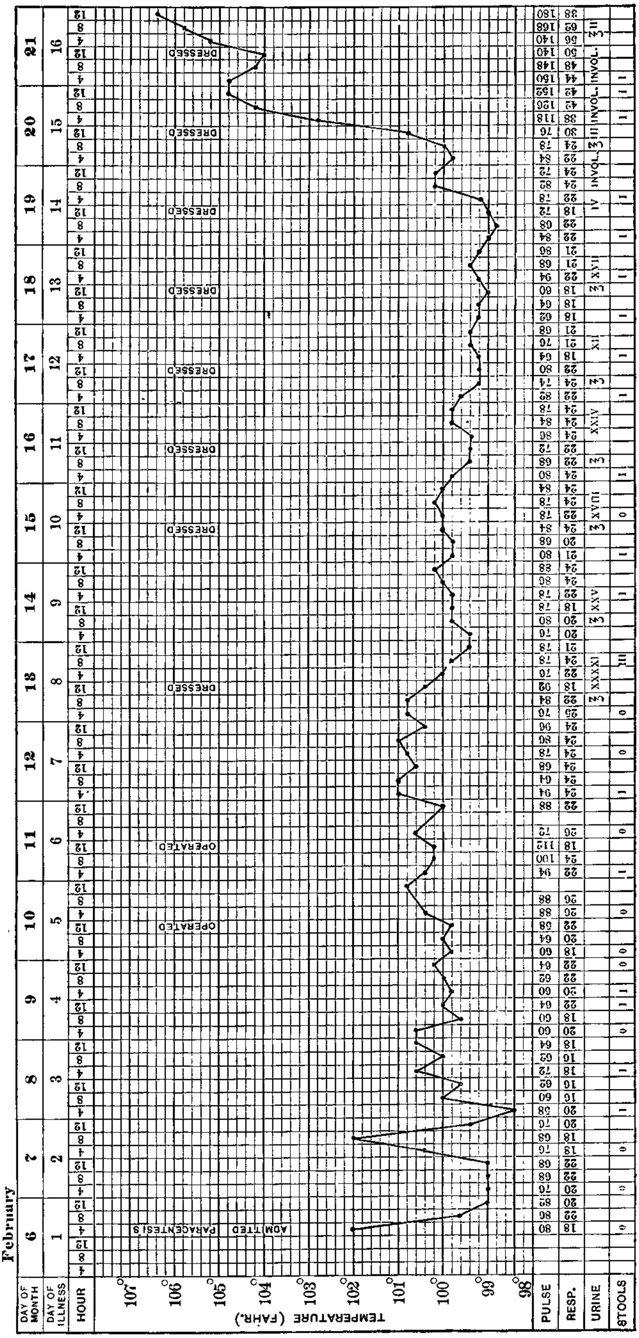
[1] Read before the American Otological Society, Boston, May 10, 1905.

Chart I.


February
DAY OF MONTH
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
DAY OF ILLNESS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
HOUR
4
8
12
TEMPERATURE (FAHR.)
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
ADMITTED
PARACENTESIS
OPERATED
OPERATED
DRESSED
PULSE
RESP.
URINE
INVOL.
STOOLS

was no mastoid tenderness at this time. The right external auditory canal was considerably narrowed throughout its entire extent. There was no marked bulging of the drum membrane, although the upper and posterior portion of the membrane could not be clearly seen on account of the narrowing of the canal. This narrowing was uniform, and was not confined to the fundus.

A free myringotomy, with the extension of the incision on the upper and posterior wall, was performed immediately after admission. A bacteriological examination of the discharge from the ear showed an unidentified bacillus in considerable numbers. General examination showed the reflexes to be about normal; power and sensation, on both sides, normal and equal; patellar reflex slightly exaggerated upon the right side. An examination of the eyes showed the fields of vision and optic disks to be normal. Physical examination of the thoracic and abdominal viscera revealed no departure from the normal standard.

There was practically no discharge from the ear following the incision of the drum membrane. The patient's condition remained about the same for three days. On the fourth day after admission there seemed to be some slight mastoid tenderness, and, owing to the irregular temperature and a leukocytosis, shown on the day of admission to be 21,400, as well as the history of the case, I decided to perform an exploratory mastoid operation. Rather extensive destruction was found in the mastoid, some free pus being present, and the cells being filled with granulation tissue. The lateral sinus was exposed, but was found to be healthy. An examination of the pus from the mastoid wound showed a mixed infection of large and small staphylococci, occurring in pairs, and, in short, irregular chains. Previous to the mastoid operation the patient had been examined by Dr. M. Allen Starr, who found no evidences of intracranial involvement. The day after the operation the patient was more stupid, and there was some paralysis of the left upper extremity. The right arm was moved constantly, and the left arm was not moved at all.

Owing to the fact that the patient was becoming steadily worse, I decided to do an exploratory craniotomy. The cranial cavity was opened an inch and a quarter above and an inch and a quarter behind the centre of the external auditory meatus, and an incision forward, downward, and inward, extending to a depth of about an inch and a half into the brain substance, evacuated about an ounce of pus. The abscess cavity was explored by means of the finger, and was then examined by means of the encephaloscope. The cavity was thoroughly dried through the encephaloscope by means of the cotton-tipped probes, and the entire abscess cavity packed with sterile gauze.

On the day after the operation the patient was able to move his left arm, and seemed brighter that afternoon than he had been at any time since his admission to the hospital. This improvement lasted for four days, when the patient became dull, and was aroused with difficulty. The abscess was dressed daily, the packing being renewed after the entire cavity had been cleansed thoroughly through the encephaloscope. From the fourth day until the ninth day after the operation the patient steadily became worse; he became more and more drowsy, the temperature gradually rose, and he died, on the tenth day after the operation, with symptoms of meningitis.

The second case was that of a young man aged twenty-one years, who presented himself at the New York Eye and Ear Infirmary on December 5, 1904, with a history of having had a constant purulent discharge from the left ear during the past two years.

On examination, a slight purulent discharge was found in the canal; the membrana tympani was very extensively destroyed; no granulation tissue was present. The radical operation was performed in the usual way. The antrum was very deeply located, and was also situated at a higher level than normal. Considerable softened bone was found in the epitympanic space, and owing to the amount of destruction and to the rather free hemorrhage during the operation, primary grafting was not deemed advisable. After the ordinary conchal flap was cut, the posterior wound was packed with iodoform gauze and allowed to remain open. A secondary skin grafting was done two weeks later, the granulations which had sprung up in the bony cavity being removed by means of the curette at the time of the grafting. Two large Thiersch grafts were applied to line the cavity, and the posterior wound was completely closed by sutures. The temperature began to rise very soon after the grafting, and three days after the secondary operation all pledgets were removed and the grafts taken away. In spite of this fact, however, the temperature four days after the secondary operation had reached 105.6°. At the dressing on the previous day the wound was found to be infected. All stitches were, therefore, removed, and the wound irrigated freely with a peroxide of hydrogen solution. The temperature then fell gradually for five days, until it reached 99.2°, and the patient seemed to be doing very well. At the time of the high temperature the blood count showed 25,000 white cells, 6,000,000 red cells, 81.5 per cent. polynuclear cells. As the temperature fell, the leukocytosis promptly disappeared, so that on December 27th, when the temperature had reached 99.2°, the leukocytosis had fallen to 13,000. The patient continued to improve, and three days later the leukocytosis had fallen to 11,000. The patient did well for about two weeks, when he gradually became dull, and the temperature began to rise slowly. He complained of considerable pain in the head and some pain in the back of the neck. An examination of the eye-grounds, on previous occasions, had been entirely negative. On January 11th, however, there was decided choking of the left optic disk and the patient

CHART II.

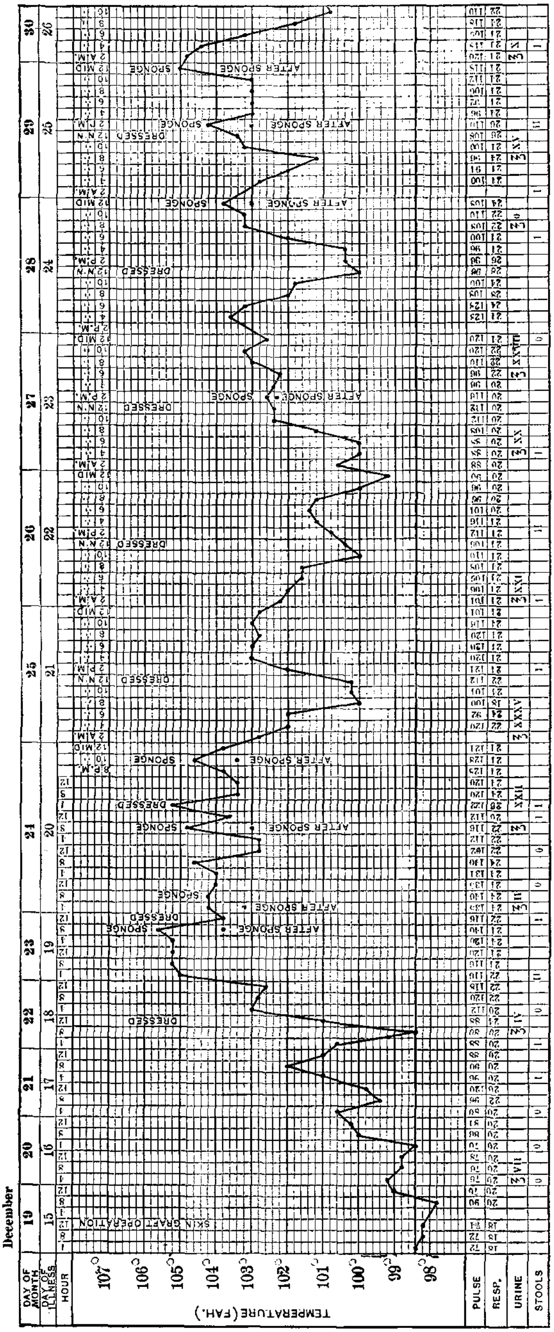

December
DAY OF MONTH
DAY OF ILLNESS
HOUR
19
20
21
22
23
24
25
26
27
28
29
30
15
16
17
18
19
20
21
22
23
24
25
26
TEMPERATURE (FAH.)
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°
PULSE
RESP.
URINE
STOOLS
SKIN GRAFT OPERATION
DRESSED
SPONGE
AFTER SPONGE
12 MID
2 A.M.
12 N.N.
2 P.M.

CHART II. (Continued.)

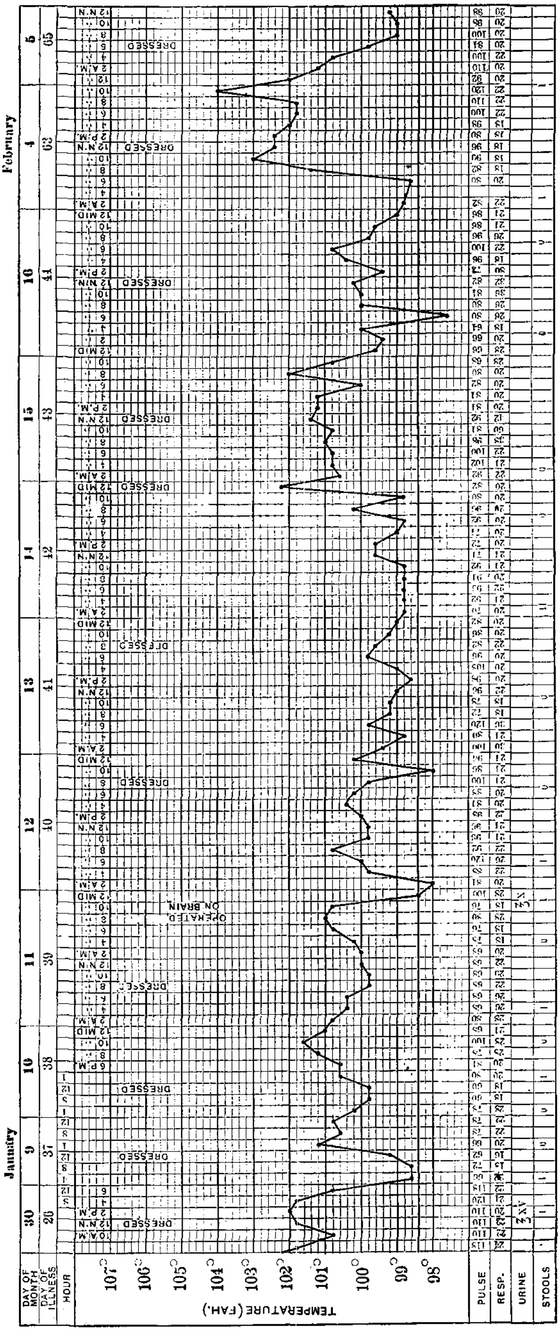
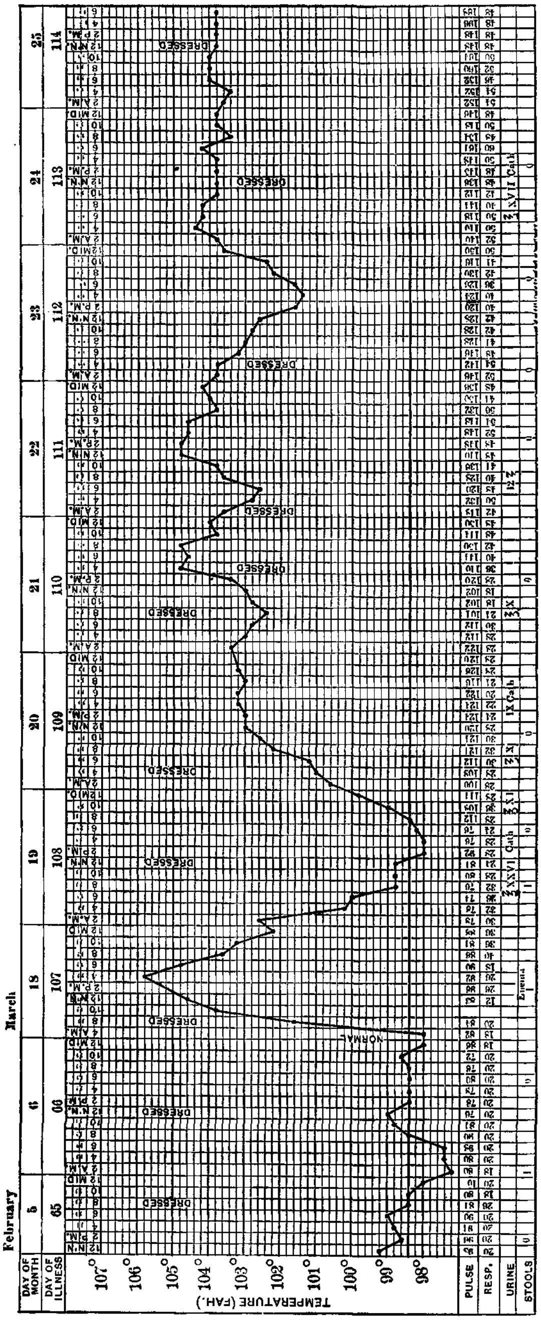


CHART II. (Continued.)



was somewhat aphasic, that is, he could not name, properly, articles which were exhibited to him. For this reason it was deemed wise to explore the temporosphenoidal lobe. A blood count at this time showed 16,500 white cells, 5,400,000 red cells; a differential count was not made at this time. An examination of the field of vision, at this time seemed to show that there was homonymous hemianopsia, involving the temporal half of the right eye and the nasal half of the left. An exploratory craniotomy was therefore performed, and a large portion of the squamous bone removed. A dural flap was then reflected upward and several punctures were made in the brain substance, with negative results. The dural flap was accordingly partially sutured over the exposed cerebral substance and the angles of the incisions in the soft parts were united by means of sutures; the incised brain tissue was dressed with iodoform gauze and separated from the radical operation cavity by iodoform gauze packing. The bandage was then applied and the patient returned to bed.

On the third day after the operation the wound was dressed and the sutures removed. About five days after the operation a small abscess formed under the anterior angle in the soft parts. This was evacuated, and the temperature, which had risen slightly, again fell to near the normal standard. About ten days after the exploratory operation, on examining the hernia cerebri, which was quite prominent, considerable pus was evacuated from the brain substance. There seemed to be two pockets in the brain substance—one extending downward, forward, and inward, and the other extending inward and slightly backward. These pockets were packed with sterile gauze, and the patient continued to do very well. He gained strength, the temperature became normal, his aphasia became less marked, and he was able to be up and about the ward. The hernia cerebri never completely disappeared, although, as the result of firm pressure and repeated excisions, it became considerably reduced in size. A small hernia, however, of an area of about the size of a twenty-five-cent piece still remained. The margins of this were excised, and an application of nitrate of silver made to the cut margins. Firm strapping of adhesive plaster was also applied over the hernia, to reduce its size.

From the time of the operation upon the brain, on January 11th, until March 18th, the patient continued to improve. There were some slight temperature remissions, but, with one or two exceptions, occurring within the first week after operation, there was never a rise above 100°, except on February 4th, when, for some unexplained reason, the temperature suddenly rose to 104°. From February 4th the patient continued steadily to improve. He gained strength, the aphasia almost entirely disappeared, and although his vision was not perfect it had improved considerably. He was able to be up and about the ward, and was anxious to leave the hospital. All of these favorable symptoms continued until March 18th, when he complained of severe pain in the head, had a chill, and became comatose, the temperature rose to 105.8°, the neck became rigid, and he presented all the evidences of meningitis. The brain substance was again opened over the region of the *hernia cerebri*, and a considerable quantity of turbid fluid evacuated. This fluid evidently came from the lateral ventricle. Immediately after the evacuation of the fluid the temperature fell to normal, but very soon rose again, and the patient died on the seventh day after the invasion of the ventricle.

These two cases present points of considerable interest.

In the first case we have a history of an acute middle-ear inflammation, with the probable involvement of the mastoid at the time of the acute invasion, and with the apparent subsidence of all mastoid symptoms for a period of two weeks. The patient then comes under observation, with ill-defined cerebral symptoms, but with no evidences either of severe middle-ear inflammation or of mastoid involvement. The operation upon the mastoid was only considered justifiable after the patient had been under observation four days, and was then performed as an exploratory measure, as there seemed to be no other reason for the patient's temperature elevation and leukocytosis. Mastoid tenderness was either absent or only present to a very slight degree. The condition of the mastoid at the time of operation and the increasing mental dulness were the indications upon which the operation was performed on the following day on the brain, and, as already detailed, this operation revealed a large temporosphenoidal abscess. As the disease, in this case, was located upon the right side, all localizing symptoms were wanting, until the paretic symptoms, referred to the opposite side of the body, made their appearance.

Whether an earlier operation would have saved this patient is a question. Considering the fact that he was examined by a prominent neurologist only forty-eight hours before I decided to do an exploratory craniotomy, and that, as the result of this consultation, operation was advised against, it would seem that any earlier operative procedure would hardly have been considered justifiable.

In the second case the high temperature immediately after the skin grafting led us to suspect at first a central pneumonia as the result of the ether anæsthesia. Repeated examination of the chest, however, failed to reveal any signs of consolidation, and, as will be seen by referring to the chart, the temperature gradually fell, until it became almost normal. The cerebral symptoms did not make their appearance until about three weeks after the secondary grafting of the middle-ear cavity. In this case the cerebral symptoms were rather complex, and seemed to indicate a somewhat extensive involvement of the brain substance; that is, the patient was aphasic, or suffering from "word blindness," which would naturally lead one to locate the lesion in the posterior portion of the temporosphenoidal lobe. In addition to this symptom, however, the appearance of homonymous hemianopsia seemed to show either involvement of the occipital lobe or of some of the commissural fibres. Owing to the wide separation of the two cortical areas involved, and presuming that the primary seat of the infection was the middle ear, it seemed wise to me to open the skull immediately above the external auditory meatus, rather than farther back over the occipital lobe. Naturally, in a case of this kind there may be multiple purulent foci. Failing to find pus in the temporosphenoidal lobe, I did not feel justified in exposing the occipital lobe at this same operation, and the steady improvement of the patient after the exploratory craniotomy seemed to rather argue against any further exploratory operation.

I feel that if in this case the opening into the cranial cavity had been made farther back, at the posterior extremity of the horizontal limb of the fissure of Sylvius, the operation might have been more successful. From the fact that pus was obtained from the brain substance a number of days after the operation, although none was obtained at the time of the operative procedure, it seems quite possible that the pus slowly worked its way along the lines of least resistance, and was evacuated spontaneously through the *hernia cerebri.* That the drainage was insufficient is clearly shown by the subsequent fatal outcome of the case.

If there is one thing which the otologist should remember more than another, in dealing with these cases, it is, I think, to attempt in every instance to open the cranial cavity as nearly over the site of the collection of pus as possible so that the abscess may drain through a minimum amount of healthy brain tissue. I think that too frequently we undertake an exploratory craniotomy without having clearly in our minds the exact locality which is involved in the purulent focus. In most of the operations I have performed upon the brain, as well as in those which I have seen performed by other otologists, the general rule of opening the cranial cavity just above the external auditory meatus has been followed, irrespective of the symptoms complained of by the patient. A closer study of the symptoms presented by each individual case, thus enabling us to locate the situation of the abscess in the brain substance, and a more exact knowledge of craniocerebral topography, so that we shall make our opening through the skull as nearly over the affected brain area as possible, will, I think, materially improve our statistics in operations for brain abscess.

For the mapping out of the various fissures and convolutions of the brain, perhaps the lines suggested by Watson Chiene are the best. These lines are as follows: A line is drawn from the glabella over the top of the head to the external occipital protuberance, and three points are taken on this line: the midpoint, the three-quarter point, and the seventh-eighths point. A second line is drawn from the external angular process of the frontal bone to the preauricular point, that is, the root of the zygoma. From the external angular process of the frontal bone a line is drawn to the three-quarter point of the original line and from the root of the zygoma a line is drawn to the seven-eighths point of the original line. The midpoint of the line between the external angular process of the frontal bone and the preauricular point is then taken, and also the midpoint of the line from the preauricular process to the seven-eighths point, on the first line drawn over the top of the head. The three midpoints are then joined, that is, the midpoint of the line running from the root of the nose to the occipital protuberance and the two midpoints just mentioned. The point where the anterior line joining the midpoints cuts the line drawn from the external angular process of the frontal bone to the three-quarter point represents the anterior extremity of the fissure of Sylvius, and just above this point lies Broca's convolution, lesion of which gives rise to motor aphasia. Where the posterior line joining the midpoints crosses this same line, that is, the line from the external process of the frontal bone to the three-quarter point, is the area of "word seeing." The area of "word hearing" lies in the superior frontal convolution, just midway between the anterior extremity of the Sylvian fissure and area of "word seeing," and just below the level of the Sylvian fissure. The anterior line joining the midpoints corresponds in its upper portion to the superior precentral fissure. A line drawn from the point already mentioned as indicating "word hearing," and parallel to the precentral fissure, marks very closely the postcentral fissure. The fissure of Rolando runs between the precentral and postcentral fissure, midway between these two. The visual area may be found by drawing a line from the three-quarter point downward and forward, following the line of the parieto-occipital fissure.

Perhaps this method of localization may possess some advantages over the older method described of making measurements from Reed's base line. It is unnecessary to remember any exact figures in drawing these lines, and as the localization is accomplished simply by taking proportionate distances along these various lines joining bony landmarks, the system is equally applicable to adults and to children.

The method of craniocerebral topography devised by Chipault is, perhaps, quite as useful as that of Watson Chiene, and, if the metric system of measurements is used, no more difficult. According to this method a line is drawn from the nasofrontal suture to the occipital protuberance. The points taken on this line are 0.45, which is the pre-Rolandic point, 0.55, 0.70, 0.80, and 0.95. The retro-orbital tubercle is then found, and three radiating lines are drawn from this—one to the 0.70 point, one to the 0.80 point, and one to the 0.95 point, on the original line. The upper of these radiating lines corresponds to the fissure of Sylvius, while the lower, in its posterior portion, corresponds to the lateral sinus. These radiating lines are then divided into tenths. A point 0.2 back on the anterior extremity of the Sylvian line corresponds to the Sylvian point, that is, to the anterior extremity of the horizontal limb of the fissure of Sylvius. The pre-Rolandic line is drawn from the 0.2 point on the Sylvian line to the 0.45 point on the line drawn from the nasofrontal suture to the occipital protuberance. The lower part of the precentral line corresponds to the vertical limb of the fissure of Sylvius. If a point 0.3 backward from the retro-orbital tubercle, measured along the Sylvian line, be joined to the 0.55 point of the line running from the nasofrontal suture to the occipital protuberance, this line will correspond to the fissure of Rolando.

The various frontal convolutions can be mapped out by dividing the pre-Rolandic line into tenths. The inferior frontal convolution extends upward on the pre-Rolandic line for about 0.3 of its length. This corresponds, of course, to the convolution of Broca. The posterior extremity of the Sylvian fissure lies at a point about one-half the distance backward, measured along the Sylvian line, and corresponds closely to the region of "word seeing."

It will be seen, therefore, that by this method the various fissures and convolutions of the brain may be thoroughly mapped out, so that it is possible for the surgeon to know exactly what portion of the brain he is exploring after the opening has been made. These lines should, I think, be laid down on the skull with extreme care prior to an exploratory craniotomy, in order to avoid unnecessary exploration of the brain substance in searching for the abscess. Of course, where localizing symptoms are absolutely wanting, the surgeon may follow the old rule—of opening the cavity just above the external auditory meatus.

A word may not be out of place in regard to the character of the incision in the soft parts in these cases. While, in writing upon this subject previously, I have ordinarily advocated an extension of the mastoid incision over the ear, well forward toward the external angular process of the frontal bone, with forcible retraction of the edges, so as to expose the bone beneath, I am convinced that even when the abscess is found this method of linear incision is far inferior to turning a tongue-shaped flap upward so as to expose the surface of the cranium over a comparatively large area. The turning-up of such a tongue-shaped flap can be very quickly done, and it shortens the operation and facilitates greatly the subsequent dressings in the case. Where the ordinary linear incision is made, or even the ordinary crossed incisions, the flaps fall together so easily that subsequent dressings are extremely painful, owing to the forcible separation of the soft parts at each dressing. If a tongue-shaped flap is elevated and the bone removed beneath, we have a perfect exposure of the cranial contents without very much retraction of the flap, and the subsequent dressing of the abscess causes the patient very little pain. If the exploration is negative, and the surgeon desires to close the exploratory wound immediately, the flap is very easily sutured in position.

In exploring these abscesses and introducing drainage I have devised a pair of very light retractors for separating the line of incision in the brain substance, thus giving a view of the deeper portion of the abscess cavity. After the abscess has been opened by means of the director or the knife, as the case may be, the director is allowed to remain in the cavity and one of these retractors is passed along the director until it enters the abscess cavity. The director is then withdrawn and the other blade of the retractor is passed along the first blade as a guide. The separation of these retractors will then show the interior of the cavity. If desired, the encephaloscope may be introduced between the retractors and the retractors removed. The disadvantage of introducing the encephaloscope at first is that it must be introduced somewhat blindly, and may do unnecessary damage to the brain substance. The thin blade of the retractor, however, can be slipped along the director and will not make a false passage. After the first dressing, I think that the encephaloscope is a very valuable instrument to be used in these cases, but I think that the narrow retractors are more serviceable at the time of operation than the encephaloscope.

ORBITAL AND MENINGEAL INFECTION FROM THE ETHMOID CELLS; DEATH; REPORT OF A CASE.[1]

By James F. McCaw, M.D.,
WATERTOWN, N. Y.,
OCULIST, AURIST, AND LARYNGOLOGIST TO THE CITY HOSPITAL AND THE JEFFERSON COUNTY ORPHAN ASYLUM; FELLOW OF THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL, AND OTOLOGICAL SOCIETY, ETC.

Nasal sinusitis, on account of the widespread interest which has been manifested for several years by the medical profession in the endeavor to arrive at a clearer understanding regarding the pathology and best methods of treatment, make the subject pregnant with interest to us as rhinologists. In the case which I report for your consideration, aside from the desirability of reporting all cases of intracranial involvement consequent upon accessory sinus

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[1] Read at the Eleventh Annual Meeting of the American Laryngological, Rhinological, and Otological Society, Boston, Mass., June 5, 6, 7, 1905.